

Country Name	<b>The Project for Improvement of Management Capacity of Operation and Maintenance for Water Supply Facilities in Nile Delta Area</b>
Arab Republic of Egypt	

**I. Project Outline**

Background	<p>In 2004, the Egyptian Government established the Holding Company for Water and Wastewater (HCWW) and designated water-supply entities into public corporations. Since the managerial responsibility for operation and maintenance (O&amp;M) of water supply facilities was transferred to public corporations, each company urged to improve operational efficiency and reduce Non-Revenue Water (NRW), which is potable water that cannot be billed, for example, due to leakage and illegal taps. JICA carried out a technical cooperation project, “the Project for Improvement of Management Capacity of Operation and Maintenance for SHAPWASCO (Sharkiya Potable Water and Sanitation Company)” between 2006 and 2009, which confirmed the effectiveness of utilizing Standard Operation Procedures (SOPs) and implementing NRW reduction activities to improve operational efficiency. HCWW formulated a plan to transfer successful practices and lessons learned from the previous technical cooperation project to Nile Delta Area for improving management capacity.</p>				
Objectives of the Project	<p>Through strengthening human resource development in Sharkiya, Gharbia and Minufia Governorates, developing and utilizing SOPs at the model facilities in Gharbia and Minufia Governorates, transferring institutional skills and experiences of SHAPWASCO for NRW reduction to NRW teams in Gharbia and Minufia Governorates, and improving water distribution management (WDM) capacity in Sharkiya Governorate as an advanced model, the project aimed at improving management capacity of water supply facilities at the model areas/facilities in the above three Governorates, thereby improving management capacity of water supply facilities in these Governorates as a whole.</p> <ol style="list-style-type: none"> <li>Overall Goal: Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia Governorates.</li> <li>Project Purpose: Management capacity of operation and maintenance of water supply facilities is improved at the model areas/facilities in Sharkiya, Gharbia and Minufia Governorates.</li> </ol>				
Activities of the Project	<ol style="list-style-type: none"> <li>Project Site: Sharkiya, Gharbia and Minufia Governorates ((1) model facilities for SOP activities: Tanta El Teraa El Melahia water treatment plant (WTP), Mahalet Marhoom iron and manganese removal plant (IMRP) and Severbay Well Station in Gharbia Governorate, Mahatet El Sadat El Satheya WTP, Gezy IMRP and Ashama Well Station in Minufia Governorate, (2) model areas for NRW reduction activities: Tanta markaz, El Mahalla El Kobra markaz and Zefta markaz in Gharbia Governorate, Shebeen El Kom markaz, Quesna markaz and Barket El Sab'a markaz in Minufia Governorate, (3) model area for WDM: Zagazig city in Sharkiya Governorate)</li> <li>Main Activities: (1) Conduct management training for the top management and Training of Trainers (TOT) for developing SOPs and NRW reduction; (2) Conduct training for developing and applying SOPs, revise SOPs for SHAPWASCO, develop SOPs for model facilities in Gharbia and Minufia Governorates based on SOPs for SHAPWASCO and conduct On-the-Job Training (OJT) for Gharbia Potable Water and Sanitation Company (GHAPWASCO) and Minufia Company for Water and Wastewater (MCWW) to apply SOPs in O&amp;M; (3) Conduct training on general practice of NRW reduction, training at the training yard and model areas for WDM in Sharkiya Governorate, prepare GIS drawing for model areas in Gharbia and Minufia Governorates and conduct water balance analysis and leakage detection survey at model areas; and (4) Formulate a plan for WDM, install the equipment for WDM at the model area, operate the system and develop SOP for WDM etc.</li> <li>Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>Japanese Side</b> <ol style="list-style-type: none"> <li>Experts: 12 persons</li> <li>Trainees Received: 15 persons</li> <li>Equipment: leak detection devices, ultrasonic water flow meters, water-level indicators, pipe and cable locators, acoustic rods, central monitoring system, telemeters, water pressure gauges, a pick-up type vehicle etc.</li> <li>Local operation cost</li> </ol> </td> <td style="width: 50%; vertical-align: top;"> <b>Egyptian Side</b> <ol style="list-style-type: none"> <li>Staff Allocated: 41 persons</li> <li>Equipment for SOP and NRW activities</li> <li>Project office and facilities</li> <li>Local operation cost (including construction cost to accommodate WDM-related equipment and construction cost of chambers to install flow meters etc.)</li> </ol> </td> </tr> </table> </li> </ol>			<b>Japanese Side</b> <ol style="list-style-type: none"> <li>Experts: 12 persons</li> <li>Trainees Received: 15 persons</li> <li>Equipment: leak detection devices, ultrasonic water flow meters, water-level indicators, pipe and cable locators, acoustic rods, central monitoring system, telemeters, water pressure gauges, a pick-up type vehicle etc.</li> <li>Local operation cost</li> </ol>	<b>Egyptian Side</b> <ol style="list-style-type: none"> <li>Staff Allocated: 41 persons</li> <li>Equipment for SOP and NRW activities</li> <li>Project office and facilities</li> <li>Local operation cost (including construction cost to accommodate WDM-related equipment and construction cost of chambers to install flow meters etc.)</li> </ol>
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Project Period	April 2011 – May 2015 (Extension Period: April 2014 – May 2015)	Project Cost	(ex-ante) 510 million yen, (actual) 502 million yen		
Implementing Agency	Holding Company for Water and Wastewater (HCWW), Sharkiya Potable Water and Sanitation Company (SHAPWASCO), Gharbia Potable Water and Sanitation Company (GHAPWASCO), Minufia Company for Water and Wastewater (MCWW)				
Cooperation Agency in Japan	Yachiyo Engineering Co., Ltd.				

**II. Result of the Evaluation**

I Relevance
<Consistency with the Development Policy of Egypt at the Time of Ex-Ante Evaluation and Project Completion> The project was consistent with Egypt's development policy such as “efficient O&M of water supply facilities” as set forth in “National

Water Resources Plan (2003-2017)”, the “Sixth Five-Year Plan of Egypt (2007-2012)” and the “Annual Development Plan (2013-2014)” (issued by the Ministry of Planning) at the times of both ex-ante evaluation and project completion.

<Consistency with the Development Needs of Egypt at the Time of Ex-Ante Evaluation and Project Completion>

The project was consistent with Egypt’s development needs for increasing the capability for operational efficiency in water supply companies at the times of both ex-ante evaluation and project completion.

<Consistency with Japan’s ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with Japan’s ODA policy as stated in the “Country Assistance Program for Egypt” (2008), which included “development of living infrastructure like water supply, sewage, and waste treatment in combination with strengthening of their operation and maintenance systems” under “poverty reduction and improvement of living standard”.

<Evaluation Result>

In light of the above, the relevance of the project is high.

## 2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the time of Project Completion>

The Project Purpose was achieved by the time of project completion. As shown in tables below, most Performance Indicators (PIs) were improved after the project implementation and targets set for these PIs were mostly achieved. While one of the PIs for WDM, i.e. the number of complaints per 1,000 connections on water suspension and low pressure, got overly worsened during the project period, this was due to the fact that electricity suspensions were increased dramatically in 2013/2014 and 2014/2015, which was out of control of SHAPWASCO.

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

The project effects have continued to the time of ex-post evaluation. SOP activities have continued at the model facilities<sup>1</sup> and expanded to five WTPs and five IMRPs in Gharbia Governorate and four WTPs in Minufia Governorate since project completion. NRW reduction activities have also continued in the model areas, and implementation of the Five-Year Plan for NRW Reduction formulated under the project has been completed. Both GHAPWASCO and MCWW have started a new NRW reduction plan to cover the whole Governorates. Furthermore, WDM activities have also continued in the model area and expanded to 12 WTPs and three other areas in Sharkiya Governorate. Accordingly, most PIs for the model facilities and areas have generally been maintained at the improved level since project completion as shown in tables below.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

The Overall Goal has been partially achieved by the time of ex-post evaluation. Among five WTPs and five IMRPs in Gharbia Governorate and four WTPs in Minufia Governorate where SOP activities have expanded to after project completion, most PIs were improved in 2018 compared with baseline figures. However, targets set for PIs have been partially achieved in WTPs and IMRPs, because the number of pump stations has increased in some WTPs resulting in an increase of energy consumption and more chemicals have been required in some facilities due to the change of raw water quality. The NRW ratio in 2018 was largely improved compared with baseline figures in both Governorates, though the 2018 ratio was slightly below the target in Minufia Governorate. On the other hand, data on WDM in Sharkiya Governorate as a whole at the time of ex-post evaluation was not available.

<Other Impacts at the time of Ex-post Evaluation>

According to MCWW, owing to this project, more attention has been paid to water losses and rehabilitations/renewals of water supply networks have increased to reduce water losses within the company.

<Evaluation Result>

Therefore, the effectiveness/impact of the project is high.

### Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results																																								
(Project Purpose) Management capacity of operation and maintenance of water supply facilities is improved at the model areas/facilities in Sharkiya, Gharbia and Minufia Governorates.	PIs(*) in the fields of management capacity of operation and maintenance are improved at the model areas/facilities.	<p>Status of the Achievement: achieved (continued)</p> <p>(Project Completion) Most PIs were improved and targets were mostly achieved in most PIs. (As for SOP-related PIs, actual figures except for energy consumption in Gezy IMRP were improved compared with baseline figures. As for NRW-related PIs, actual figures were improved in all model areas compared with baseline figures. As for WDM-related PIs, the ratio of inappropriate pressure of water distribution was improved compared with baseline figure, while the number of complaints per 1,000 connections on water suspension and low pressure got overly worsened as explained above.)</p> <p>(Ex-post Evaluation) Most PIs have been maintained at the improved level.</p> <p>[SOP]</p> <p>Model Facilities in Gharbia Governorate</p> <table border="1"> <thead> <tr> <th>Tanta El Teraa El Melahia WTP</th> <th>Energy consumption per m<sup>3</sup> of water production</th> <th>Amount of chlorine used per m<sup>3</sup> of water production</th> <th>Amount of alum sulfate used per m<sup>3</sup> of water production</th> <th>Effective utilization of raw water</th> </tr> </thead> <tbody> <tr> <td>Baseline (Nov 2012)</td> <td>0.39kWh/m<sup>3</sup></td> <td>9g/m<sup>3</sup></td> <td>38g/m<sup>3</sup></td> <td>85%</td> </tr> <tr> <td>Target</td> <td>0.35kWh/m<sup>3</sup></td> <td>8g/m<sup>3</sup></td> <td>35g/m<sup>3</sup></td> <td>90%</td> </tr> <tr> <td>Average during April to June 2014</td> <td>0.36kWh/m<sup>3</sup></td> <td>8g/m<sup>3</sup></td> <td>37g/m<sup>3</sup></td> <td>87%</td> </tr> <tr> <td>Annual Average in 2018</td> <td>0.38kWh/m<sup>3</sup></td> <td>8g/m<sup>3</sup></td> <td>39g/m<sup>3</sup></td> <td>90%</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Mahalet Marhoom IMRP</th> <th>Energy consumption per m<sup>3</sup> of water production</th> <th>Amount of calcium hypochlorite used per m<sup>3</sup> of water production</th> <th>Amount of potassium permanganate used per m<sup>3</sup> of water production</th> <th>Effective utilization of raw water</th> </tr> </thead> <tbody> <tr> <td>Baseline (Nov 2012)</td> <td>0.76kWh/m<sup>3</sup></td> <td>7g/m<sup>3</sup></td> <td>3g/m<sup>3</sup></td> <td>N/A</td> </tr> <tr> <td>Target</td> <td>0.60kWh/m<sup>3</sup></td> <td>6g/m<sup>3</sup></td> <td>2g/m<sup>3</sup></td> <td>96%</td> </tr> </tbody> </table>	Tanta El Teraa El Melahia WTP	Energy consumption per m <sup>3</sup> of water production	Amount of chlorine used per m <sup>3</sup> of water production	Amount of alum sulfate used per m <sup>3</sup> of water production	Effective utilization of raw water	Baseline (Nov 2012)	0.39kWh/m <sup>3</sup>	9g/m <sup>3</sup>	38g/m <sup>3</sup>	85%	Target	0.35kWh/m <sup>3</sup>	8g/m <sup>3</sup>	35g/m <sup>3</sup>	90%	Average during April to June 2014	0.36kWh/m <sup>3</sup>	8g/m <sup>3</sup>	37g/m <sup>3</sup>	87%	Annual Average in 2018	0.38kWh/m <sup>3</sup>	8g/m <sup>3</sup>	39g/m <sup>3</sup>	90%	Mahalet Marhoom IMRP	Energy consumption per m <sup>3</sup> of water production	Amount of calcium hypochlorite used per m <sup>3</sup> of water production	Amount of potassium permanganate used per m <sup>3</sup> of water production	Effective utilization of raw water	Baseline (Nov 2012)	0.76kWh/m <sup>3</sup>	7g/m <sup>3</sup>	3g/m <sup>3</sup>	N/A	Target	0.60kWh/m <sup>3</sup>	6g/m <sup>3</sup>	2g/m <sup>3</sup>	96%
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<sup>1</sup> Some WTPs and IMRPs operated and maintained by GHAPWASCO and MCWW have been handed over to other organizations under the Ministry of Housing, Utilities and Urban Communities according to Presidential Decrees after project completion.

Average during Jan to Mar 2014	0.62kWh/m <sup>3</sup>	3g/m <sup>3</sup>	2g/m <sup>3</sup>	96%
Annual Average in 2018	0.58kWh/m <sup>3</sup>	4g/m <sup>3</sup>	2g/m <sup>3</sup>	94%

#### Model Facilities in Minufia Governorate

Mahatet El Sadat El Satheya WTP	Energy consumption per m <sup>3</sup> of water production	Amount of chlorine used per m <sup>3</sup> of water production	Amount of alum sulfate used per m <sup>3</sup> of water production	Effective utilization of raw water
Baseline (Nov 2012)	0.45kWh/m <sup>3</sup>	9g/m <sup>3</sup>	26g/m <sup>3</sup>	88%
Target	0.36kWh/m <sup>3</sup>	7g/m <sup>3</sup>	18g/m <sup>3</sup>	92%
Average during April to June 2014	0.36kWh/m <sup>3</sup>	6g/m <sup>3</sup>	25g/m <sup>3</sup>	94%
Annual Average in 2018	N/A	N/A	N/A	N/A

  

Gezy IMRP	Energy consumption per m <sup>3</sup> of water production	Amount of calcium hypochlorite used per m <sup>3</sup> of water production	Amount of potassium permanganate used per m <sup>3</sup> of water production	Effective utilization of raw water
Baseline (Nov 2012)	0.8kWh/m <sup>3</sup>	4g/m <sup>3</sup>	2g/m <sup>3</sup>	84%
Target	0.5kWh/m <sup>3</sup>	7g/m <sup>3</sup>	1g/m <sup>3</sup>	92%
Average during April to June 2014	0.8kWh/m <sup>3</sup>	7g/m <sup>3</sup>	1g/m <sup>3</sup>	89%
Annual Average in 2018	0.8kWh/m <sup>3</sup>	7g/m <sup>3</sup>	1g/m <sup>3</sup>	92%

#### [NRW]

Model Areas	PI	Baseline	Target	After Project 2014	Annual Average in 2018
<b>Gharbia Governorate</b>					
Tanta	NRW ratio	40.1%	28.0%	24.7%	24%
	Reduction rate of NRW	-	30.0%	38.4%	40%
El Mahalla El Kobra	NRW ratio	27.1%	20.3%	22.0%	19%
	Reduction rate of NRW	-	25.0%	18.8%	30%
Zefta	NRW ratio	21.2%	15.9%	21.0%	15%
	Reduction rate of NRW	-	25.0%	0.9%	29%
<b>Minufia Governorate</b>					
Shebeen El Kom	NRW ratio	19.6%	14.7%	16.5%	20%
	Reduction rate of NRW	-	25.0%	15.8%	-2%
Quesna	NRW ratio	29.8%	22.3%	22.5%	20%
	Reduction rate of NRW	-	25.0%	24.5%	33%
Berket El Sab'a	NRW ratio	27.1%	20.3%	20.2%	20%
	Reduction rate of NRW	-	25.0%	25.4%	26%

#### [WDM]

PI	Baseline	Target	2014/15	2018
Number of complaints per 1,000 connections on water suspension and low pressure in Zagazig city	13.92	11.13	42.67	10
Ratio of inappropriate pressure of water distribution in Zagazig city	8.0%	7.0%	7.0%	5.0%

(Overall Goal)  
Management capacity of operation and maintenance of water supply facilities is improved in Sharkiya, Gharbia and Minufia Governorates.

PIs (\*) in the fields of management capacity of operation and maintenance are improved in Sharkiya, Gharbia, and Minufia Governorates.

(Ex-post Evaluation) partially achieved

Regarding SOP, most PIs have been improved compared with baseline figures in both Gharbia and Minufia Governorates, though targets have been partially achieved in WTPs and IMRPs. The NRW ratio has been largely improved compared with baseline figures in both Governorates. On the other hand, data on WDM in Sharkiya Governorate as a whole was not available.

#### [SOP]

##### Gharbia Governorate

Name of WTP		Energy consumption per m <sup>3</sup> of water production	Amount of chlorine used per m <sup>3</sup> of water production	Amount of alum sulfate used per m <sup>3</sup> of water production	Effective utilization of raw water
Damrou	Baseline	0.40kWh/m <sup>3</sup>	8g/m <sup>3</sup>	40g/m <sup>3</sup>	88%
	Target	0.30kWh/m <sup>3</sup>	7g/m <sup>3</sup>	36g/m <sup>3</sup>	90%
	Annual Average in 2018	0.33kWh/m <sup>3</sup>	8g/m <sup>3</sup>	38g/m <sup>3</sup>	90%
El Santa	Baseline	0.33kWh/m <sup>3</sup>	8g/m <sup>3</sup>	48g/m <sup>3</sup>	89%
	Target	0.28kWh/m <sup>3</sup>	6g/m <sup>3</sup>	42g/m <sup>3</sup>	92%
	Annual Average in 2018	0.28kWh/m <sup>3</sup>	7g/m <sup>3</sup>	47g/m <sup>3</sup>	90%
Basyoon	Baseline	0.40kWh/m <sup>3</sup>	10g/m <sup>3</sup>	45g/m <sup>3</sup>	85%
	Target	0.30kWh/m <sup>3</sup>	6g/m <sup>3</sup>	40g/m <sup>3</sup>	90%
	Annual Average in 2018	0.31kWh/m <sup>3</sup>	9g/m <sup>3</sup>	43g/m <sup>3</sup>	86%
Samanoud	Baseline	0.35kWh/m <sup>3</sup>	8g/m <sup>3</sup>	40g/m <sup>3</sup>	82%
	Target	0.30kWh/m <sup>3</sup>	7g/m <sup>3</sup>	36g/m <sup>3</sup>	92%
	Annual Average in 2018	0.33kWh/m <sup>3</sup>	6g/m <sup>3</sup>	36g/m <sup>3</sup>	90%
Zefta	Baseline	0.42kWh/m <sup>3</sup>	8g/m <sup>3</sup>	44g/m <sup>3</sup>	90%
	Target	0.39kWh/m <sup>3</sup>	6g/m <sup>3</sup>	40g/m <sup>3</sup>	91%
	Annual Average in 2018	0.40kWh/m <sup>3</sup>	6g/m <sup>3</sup>	38g/m <sup>3</sup>	90%

  

Name of IMRP		Energy consumption per m <sup>3</sup> of water production	Amount of calcium hypochlorite used per m <sup>3</sup> of water production	Amount of potassium permanganate used per m <sup>3</sup> of water production	Effective utilization of raw water
El Ramliya	Baseline	0.60kWh/m <sup>3</sup>	7g/m <sup>3</sup>	3g/m <sup>3</sup>	82%
	Target	0.35kWh/m <sup>3</sup>	3g/m <sup>3</sup>	2g/m <sup>3</sup>	90%
	Annual Average in 2018	0.40kWh/m <sup>3</sup>	4g/m <sup>3</sup>	2g/m <sup>3</sup>	91%
Kaser Boghdad	Baseline	0.52kWh/m <sup>3</sup>	7g/m <sup>3</sup>	5g/m <sup>3</sup>	83%
	Target	0.33kWh/m <sup>3</sup>	3g/m <sup>3</sup>	2g/m <sup>3</sup>	90%
	Annual Average in 2018	0.44kWh/m <sup>3</sup>	6g/m <sup>3</sup>	4g/m <sup>3</sup>	87%
Mashiat Elyaqubya	Baseline	0.56kWh/m <sup>3</sup>	8g/m <sup>3</sup>	4g/m <sup>3</sup>	82%
	Target	0.40kWh/m <sup>3</sup>	3g/m <sup>3</sup>	2g/m <sup>3</sup>	90%
	Annual Average in 2018	0.53kWh/m <sup>3</sup>	6g/m <sup>3</sup>	3g/m <sup>3</sup>	88%
Damat	Baseline	0.43kWh/m <sup>3</sup>	6g/m <sup>3</sup>	5g/m <sup>3</sup>	86%

	Damanhor Elwahsh	Target	0.35kWh/m <sup>3</sup>	3g/m <sup>3</sup>	2g/m <sup>3</sup>	90%	
		Annual Average in 2018	0.38kWh/m <sup>3</sup>	4g/m <sup>3</sup>	2g/m <sup>3</sup>	91%	
		Baseline	0.59kWh/m <sup>3</sup>	8g/m <sup>3</sup>	6g/m <sup>3</sup>	83%	
		Target	0.38kWh/m <sup>3</sup>	3g/m <sup>3</sup>	3g/m <sup>3</sup>	90%	
		Annual Average in 2018	0.54kWh/m <sup>3</sup>	7g/m <sup>3</sup>	5g/m <sup>3</sup>	86%	
	<b>Minufia Governorate</b>						
	Name of WTP		Energy consumption per m <sup>3</sup> of water production	Amount of chlorine used per m <sup>3</sup> of water production	Amount of alum sulfate used per m <sup>3</sup> of water production	Effective utilization of raw water	
	Shebeen El Kom	Baseline	0.27kWh/m <sup>3</sup>	8g/m <sup>3</sup>	26g/m <sup>3</sup>	89%	
		Target	0.25kWh/m <sup>3</sup>	5g/m <sup>3</sup>	20g/m <sup>3</sup>	92%	
		Annual Average in 2018	0.24kWh/m <sup>3</sup>	7g/m <sup>3</sup>	20g/m <sup>3</sup>	91%	
Tala	Baseline	0.26kWh/m <sup>3</sup>	6g/m <sup>3</sup>	25g/m <sup>3</sup>	90%		
	Target	0.25kWh/m <sup>3</sup>	5g/m <sup>3</sup>	20g/m <sup>3</sup>	92%		
	Annual Average in 2018	0.26kWh/m <sup>3</sup>	6g/m <sup>3</sup>	22g/m <sup>3</sup>	92%		
El shohada	Baseline	0.28kWh/m <sup>3</sup>	9g/m <sup>3</sup>	31g/m <sup>3</sup>	90%		
	Target	0.25kWh/m <sup>3</sup>	5g/m <sup>3</sup>	20g/m <sup>3</sup>	92%		
	Annual Average in 2018	0.23kWh/m <sup>3</sup>	6g/m <sup>3</sup>	22g/m <sup>3</sup>	92%		
El dabiba	Baseline	0.48kWh/m <sup>3</sup>	8g/m <sup>3</sup>	20g/m <sup>3</sup>	89%		
	Target	0.25kWh/m <sup>3</sup>	5g/m <sup>3</sup>	20g/m <sup>3</sup>	92%		
	Annual Average in 2018	0.23kWh/m <sup>3</sup>	5g/m <sup>3</sup>	15g/m <sup>3</sup>	93%		
<b>[NRW]</b>							
Governorate	PI	Baseline	Target	Annual Average in 2018			
Gharbia	NRW ratio	35%	25%	19%			
	Reduction rate of NRW	-	28%	46%			
Minufia	NRW ratio	28%	20%	22%			
	Reduction rate of NRW	-	28%	21%			

Note: \*PIs for SOP: (a) Energy consumption per m<sup>3</sup> of water production (kWh/m<sup>3</sup>), (b) Amount of chlorine/alum sulfate/calcium hypochlorite/potassium permanganate used per m<sup>3</sup> of water production (g/m<sup>3</sup>), (c) Ratio of effective utilization of raw water (%); PIs for NRW: (a) NRW ratio (%), (b) Reduction ratio of NRW (%); PIs for WDM: (a) Number of complaints per 1,000 connections on water suspension and low pressure, (b) Ratio of inappropriate pressure of water distribution (%)

\*\* Reduction rate of NRW (%) = (“NRW ratio before improvement (%)” - “NRW ratio after improvement (%)”) / “NRW ratio before improvement (%)”

\*\*\* Low service pressure ratio = “Total hours of low pressure recorded at all continuous monitoring points” / (“Number of points for continuous pressure monitoring” x 365days x 24hours)

Source: Project Final Report, questionnaire survey and interview with GHAPWASCO, MCWW and SHAPWASCO

### 3 Efficiency

The project cost was within the plan, however, the project period exceeded the plan (ratio against plan: 98%, 125%, respectively). While the project period was extended for five months because of Japanese experts’ evacuation from Egypt due to security reasons, this extension period is not counted as the project period. On the other hand, the duration for WDM activities was further extended for nine months due to the delay in procurement of the remote monitoring system and technical errors in the software of the system, which is counted as the project period. The outputs of the project were produced as planned. Therefore, the efficiency of the project is fair.

### 4 Sustainability

#### <Policy Aspect>

The needs for reducing water losses in water supply networks and improving the water management system are stated in the sustainable development strategy, “Egypt Vision 2030”.

#### <Institutional Aspect>

There are departments responsible for SOP and NRW activities both in GHAPWASCO and MCWW, and there is a department responsible for WDM activities in SHAPWASCO. In GHAPWASCO, 37 staff in total is in charge of SOP activities and 26 staff in total is in charge of NRW activities. In MCWW, 30 staff in total is in charge of SOP activities and 40 staff in total is in charge of NRW activities. In SHAPWASCO, nine staff in total is in charge of WDM activities. According to these three companies, the number of staff is sufficient to manage SOP, NRW and WDM activities in three Governorates.

#### <Technical Aspect>

Most staff for whom necessary technical skills were transferred under the project still work in three companies. According to these companies, the skill level of staff is sufficient to manage SOP, NRW and WDM activities in three Governorates. According to GHAPWASCO, staff training is conducted according to their needs, and training on leakage detection and O&M of necessary equipment was provided for 23 staff in 2018. According to MCWW, staff training is conducted regularly, and training on SOP, leakage detection and O&M of necessary equipment was conducted twice both in 2017 and 2018 for 25 staff each (100 staff in total). In SHAPWASCO, training on WDM and O&M of necessary systems and equipment was provided by external companies once a year in 2016, 2017 and 2019 for 19 staff in total. SOPs and manuals produced under the project have continuously been utilized in GHAPWASCO, MCWW and SHAPWASCO. It was observed during the ex-post evaluation that most equipment procured under the project is also used in a good condition.

#### <Financial Aspect>

In GHAPWASCO, approximately 3.5 to 3.9 million LE per year was allocated for rehabilitation and maintenance of water supply facilities (WTPs, IMRPs and wells) and approximately 2.7 to 7.0 million EGP per year was allocated for replacing and renewal of water pipes in the fiscal years of 2016/17, 2017/18 and 2018/19. In MCWW, approximately 3.0 to 5.5 million EGP per year was allocated for rehabilitation and maintenance of water supply facilities and approximately 2.2 to 3.6 million EGP per year was allocated for replacing and renewal of water pipes in the fiscal years of 2016/17, 2017/18 and 2018/19. In SHAPWASCO, approximately 2.0 to 5.0 million EGP per year was allocated for WDM activities in the fiscal years of 2016/17, 2017/18 and 2018/19. According to these companies, the budget amount is sufficient to manage SOP, NRW and WDM activities in three Governorates, and in case they need more budget, HCWW can provide financial assistance.

#### <Evaluation Result>

In light of the above, no problem has been observed in terms of the policy, institutional, technical and financial aspects. Therefore, the sustainability of the effectiveness through the project is high.

## 5 Summary of the Evaluation

The project had achieved the Project Purpose at project completion, and it partially achieved the Overall Goal at ex-post evaluation: most PIs were improved and targets were mostly achieved in model facilities/areas. Most PIs have been improved compared with baseline figures in Gharbia and Minufia Governorates as a whole, while targets have been partially achieved in WTPs and IMRPs and data on WDM in Sharkiya Governorate as a whole was not available. Regarding the sustainability, no problem has been observed. Regarding the efficiency, the project period exceeded the plan.

Considering all of the above points, this project is evaluated to be highly satisfactory

## III. Recommendations & Lessons Learned

### Recommendations for Implementing Agency:

- It is recommended that HCWW would share the knowledge and experiences gained through the project with all of its 25 affiliated companies to enhance project effects. Also, HCWW would consider providing training for participants from other countries such as Middle East and African regions to share its successful experiences obtained under the project.

### Lessons Learned for JICA:

- If a project achieves good results and project counterparts prove to be efficient by the time of mid-term evaluation, JICA can consider conducting a knowledge sharing seminar for relevant authorities in other governorates and/or a third country training program for participants from other countries within the remaining period of the project to share the good results.
- While most equipment procured under the project is used in a good condition, minor troubles were observed in batteries for portable flow meters. This equipment was imported from Japan and implementing agencies had difficulties to find a local supplier of spare parts. Thus, when procuring equipment under a project, suppliers who have local branches or at least local agents in the recipient country should be selected so that implementing agencies can obtain necessary after-sales service and spare parts.



SOP in Tanta El Teraa El Melahia WTP (model facility)  
(GHAPWASCO)



SOP in Shebeen El Kom WTP (non-model facility) (MCWW)